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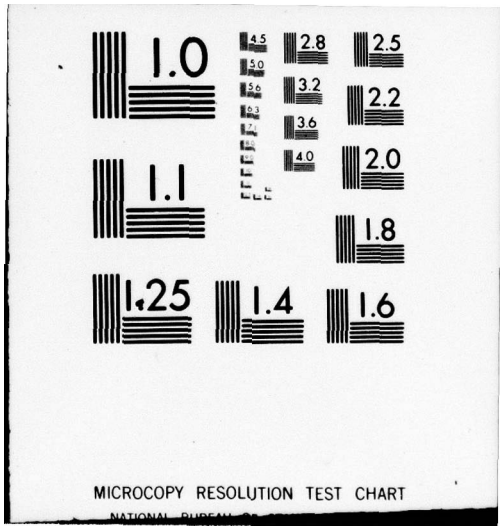
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FOREIGN TECHNOLOGY DIVISION

COMMUNICATIONS COMPUTERS

By

Marian Molski

EDITED TRANSLATION

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Communications Computers by M. Molski

The equipment structure of a computer network is formed by the following elements:

- computers, being central elements of the network and fulfilling a service role for network consumers
- terminal equipment installed in the consumer's network and allowing him contact with the computer
- telecommunications links enabling connection of network elements among themselves
- additional equipment whose task is the rationalization of transmission, e.g., multiplexers and concentrators.

If these latter are replaced by computers, then they can be included in communications computers. Communications computers as distinguished from the main computers of a computer network (computer, main computer), performing real data processing ordered by terminal equipment perform functions connected with the organization of the data transfer process.

FUNCTIONS OF COMMUNICATIONS COMPUTERS

The communications computer, among the most important functions, performs the following:

* control, or:

- initiating and controlling the retrieval
- grouping bits into characters and characters into messages
- transferring edited messages to the main computer
- accepting messages from the main computer
- preparing messages for transmission by completing them into control and address characters
- initiating transmission
- supervising the transmission process
- accepting verification from the receiving equipment

* verification and correction of data
* matching computer network equipment:

- change of code representation
- matching linking and equipment speed

* buffering of transferred data.

An advantage of communications computers is the adaptability of their functions and parameters to network needs. Through a simple change in the operation program of the computer we can adjust it for operation in a modified configuration of the equipment and lines connected to it, in varied conditions affecting transmission parameters.

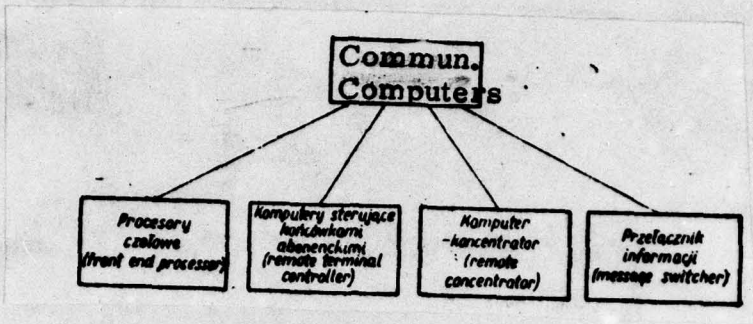


Fig. 1. Classification of communicatinns computers.

CLASSIFICATION OF COMMUNICATIONS COMPUTERS

Keeping in mind the above specified functions of the communications computer and its place in the computer network the communications computers can be divided into classes, which Figure 1 presents symbolically.

The Front-end Processor is a kind of programmed control unit operating in close companionship with the main computer and it frees it from typical communications functions. Separating processing functions from communications functions is necessary with respect to system efficiency. If this is not done, then as a result of the frequent interruption caused by the need to perform communications functions, the efficiency of the main computer decreases considerably.

An advantage of using a front-end process is also the considerable lightening of the main working and mass store and the independability of the data transfer service even in the case of the temporary inefficiency of the main

computer. The front-end processor controls the data transfer lines and terminal equipment designating the transmitting sequence to the main computer. An important task is the verification and correction of data and the change of the code in which data flows to the code of the main computer.

The Remote Terminal Controller is used when several pieces of equipment enter into the composition of the remote terminal and then in a program way it replaces non-programmed operation of the control unit. It fulfills a series of functions similar to those realized through the front-end processor.

The input of suitable data can also set programs in motion after receiving from the main (or front-end) computer conventional characters, which permits a lightening of transmission lines. It has as its task the buffering of freely flowing data in order to feed it to the line quickly.

The Remote Concentrator is used most often in place of the concentration of a larger number of remote terminals located at a specific distance from the main computer.

It possesses the ability to gather data from many terminals and to form them into a more concentrated flow. This is an unusually important task in the case when the time distribution of transmitted data in the network (e. g. ,

from the teletype) undergoes great fluctuations. Using the concentrator avoids building lines having greater capacity. Besides the basic task, which is concentration, this computer can perform a series of functions discussed in the following section of this article.

The Message Switcher effects a distribution of information among several points of a decentralized network.

In developed computer networks it analyzes transmitted information in order to define their optimal routes and leads them to corresponding points in the network.

The statement can be ventured that these computers are in reality the most difficult class. Message switchers can perform, to a lesser or greater degree, like other communications computers, the real functions of this type remaining to computers.

In order to approximate the more discussed classification division, Figure 2 gives an example of a fictional computer network where places of the computers discussed are designated.

As concluded from the classification given and the sample topology,

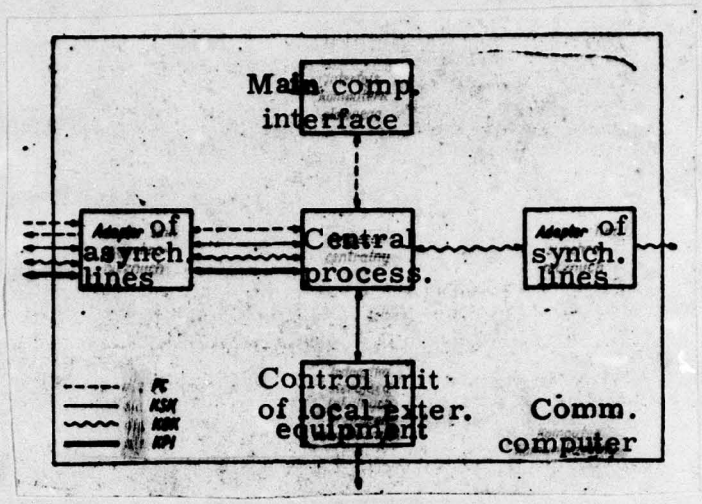
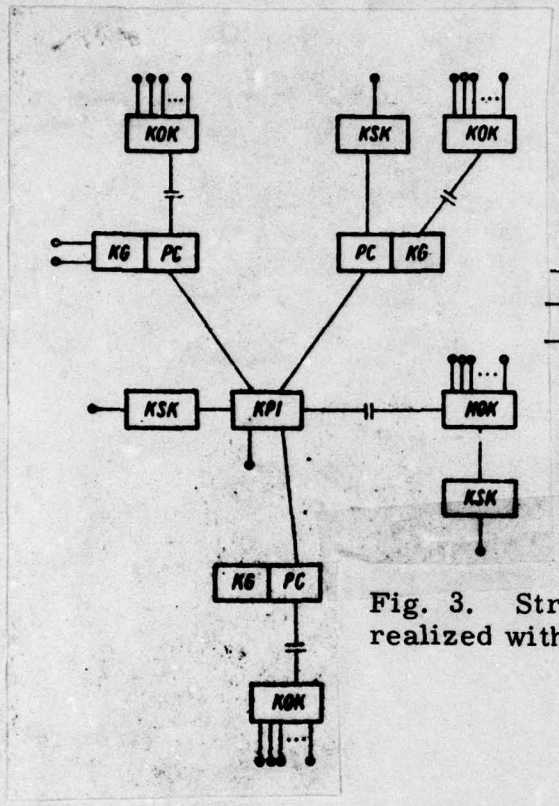


Fig. 2. Example of location of communications computers in a computer network.

between the remote terminal and the main computer several communications computers can operate and each of them can be a point in the network. The structure of the network point created in support of the different kinds of communications computers is given in Figure 3. The chief element of each point is the central processor and united to it the external stores. The remaining elements are added on depending on the character in which the point is to operate, i.e., depending on whose role it should fill of the above mentioned communications computers.

SPECIFIC FEATURES OF COMMUNICATIONS COMPUTERS

Reaching the most efficient performance of communications functions in the network caused the rise of many communications computers. Individual



Key to Symbols

KG	Main computer
KOK	Remote concentrator
KSK	Remote terminal controller
PC	Front-end processor
KPI	Message switcher
__ ___	Great distance
—o——	Terminal w/1 unit of equipment
—o——	Terminal w/many units of equip.

Fig. 3. Structure of elements of computer network, realized with a communications computer.

computers are characterized by various solutions concerning logic architecture as well as software.

The logic architecture of the central processor does not vary basically from the architecture of other processors, however several distinguishing features can be observed:

-- the machine word has 1, 2, or 4 control bits

-- almost all known types of address modification are used

-- there is a developed (priority) interrupt system

-- control is microprogrammed using a fixed store

-- in the majority of cases the communications computer is a mini-computer

-- a large number of various channels (e.g., selectors, multiplexers, special)

-- every communications computer colaborates with mass store (most often, magnetic disk)

-- sometimes two processors are used, one of which services quick lines, and the other, slow lines.

The central processor as such is not an element chiefly which decides the purpose of the computer's operation as a communications computer.

The specific quality which distinguishes communications computers is the possibility of auxiliary blocks.

In all types of communications computers there are line adapters which were detailed in Figure 3.

It can be proven that the tasks of individual line adapters are secondary functions, which in relation to the line, the given communications computer should fulfill.

The line adapter of a front-end processor collects and distributes data characters among the lines and with the front-end processor, conducts data control, and transmits the control results to the central processor, permits the selection of proper transmission speed and has the capability of transmitting interruptions to the central processor in the case of the detection of a definite character.

SPECIFIC SOFTWARE FEATURES

The performance by a communications computer of a certain group of operations with respect to data taken from the lines or in regard to transmitted data takes place after a definite macroinstruction calling determined by a denomination of communications macroinstruction.

As an example, the basic tasks of communications macroinstruction (for the MODCOMP III computer) are:

- removing synchronized and blank characters
- calculating cyclic control total
- searching for control characters in received messages.

In the list of instructions for communications computers besides the instructions for general purposes there are communications-oriented instructions.

For instance, the most important communications-oriented instructions (for the MICRO 812 computer) are:

- generate cyclic code
- test character
- generate ASC II parity.

The instruction "generate cyclic code" will cause the repetitive cyclic code, which concerns the storage block beginning with the address in the B-register and ending with the address contained in the X-register, to be computed and recorded.

The instruction "test character" effects the comparison of bytes in the storage block beginning with the address contained in the X-register and ending with the address contained in the B-register, with the bytes on the so-called control sheet. When the comparison is compatible, there is a jump to the address contained in the word, which is located on the control sheet close to the byte to which the comparison applied. After completing the jump the X-register contains the address of the byte in the data block, to which the comparison applied.

The instruction "generate ASC II parity" generates and links up to each character a non-parity bit and computes and records in the "lower byte"

of the A-register an 8-bit longitudinal parity block concerning the storage area limited by the addresses contained in the X- and B-registers.

Typical data transmission software or, e.g., the packets BTAM (Basic Telecommunications Access Method) and TCAM (Telecommunications Access Method) are extensively discussed in available literature and for that reason we are omitting their discussion here.

MANUFACTURERS OF COMMUNICATIONS COMPUTERS

Many companies which manufacture computers include the class of communications computers in their assortment. Some of the companies manufacture several types of this kind of computer. These computers very often have the potential possibilities to fulfill the functions of all kinds of communications computers, while a concrete application depends on the manner of linking modules (Fig. 2).

Among the chief manufacturers of communications computers we can name American Data System, CDC, Computer Communications, COMTEC Data System, Digital Equipment Corporation, AMR-Computer, Honeywell, Interdata, IBM, Modular Computer System, Microdata, Tempo Computers, Varian Data Machines.

Until just recently in computer science there were clearly separated such classes of computers as universal, for numeric-engineering applications, designed for administration applications and to control and check technological or research processes. The information presented in the article, although of necessity given in an abbreviated form, should reassure us in a satisfactory way that communications computers constitute a new class which, even for sake of functional distinction deserves separate treatment. In creating a vision of a computer network and wanting to regard it seriously, the problematics connected with communications computers cannot be set aside. It requires certainly a group effort and uniform front of action from the human environment, concerned with computer science on the one hand and telecommunication on the other hand, and from both the industrial and scientific environment.

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